(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 403 214 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 90306370.9

(51) Int. Cl.5: A61J 3/07

(22) Date of filing: 12.06.90

(30) Priority: 12.06.89 JP 148651/89

(43) Date of publication of application:
19.12.90 Bulletin 90/51

(84) Designated Contracting States:
BE DE ES FR GB IT

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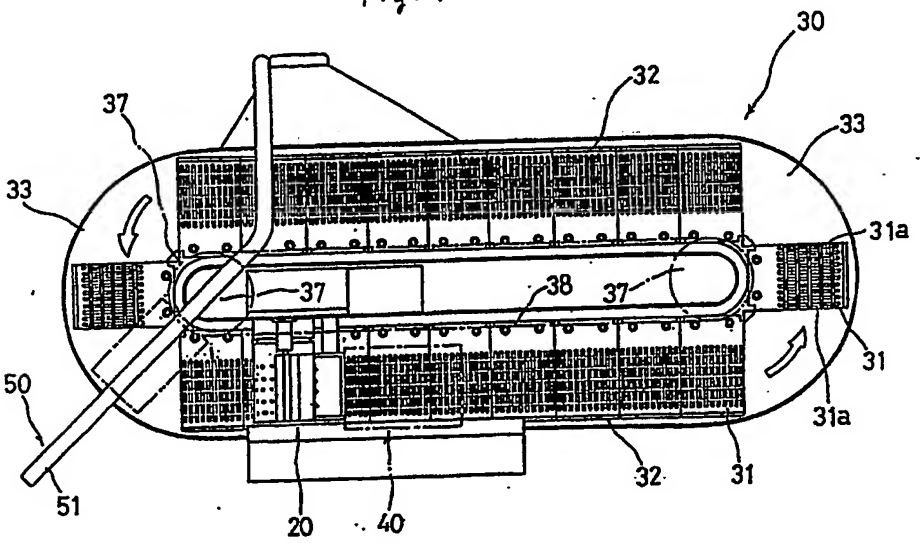
(54) A capsule sealing apparatus.

(57) A capsule sealing apparatus which includes a capsule conveyor device (30) with horizontally maintained slats (31) on which capsules (90) are mounted horizontally throughout the travel, during which the seams between the caps (92) and bodies (91) of the capsules (90) are sealed by rotary coating discs (42a, 43a) that pick up the sealer from a tank (41) disposed below the capsule conveyor device (30).

Fig. 1



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The present invention relates to a capsule sealing apparatus, and more particularly to an apparatus for sealing the seams between the caps and the bodies of capsules containing powdery, granular, or liquid pharmaceutics and foodstuff.

It is known in the art to charge powdery, granular, or liquid pharmaceutics in capsules made of hard gelatin so that patients can swallow with ease. The capsules of hard gelatin have a hollow cylindrical body and a hollow cylindrical cap having a larger diameter than the body. The body is fitted in the cap after contents are charged in the body.

Depending upon the nature of the content, it is necessary to close the body with the cap liquid-tightly. If the joint between the cap and the body becomes loose after the content is charged, the content is likely to leak, and/or dirt and germs are likely to enter the capsules. This causes fatal unsanitary problems.

The inventors have made an invention relating to an apparatus for automatically sealing charged capsules, which is disclosed in Japanese Laid-Open Patent Publication (Kokai) No.· 60-190964. This prior capsule sealing apparatus includes a plurality of plate-like slats on which capsules are individually mounted. Each capsule is made of a cap and a body, and during travel of the conveyor device the seam between the cap and body is sealed with a sealing medium (hereinafter referred to as "sealer") that is picked up and coated by a coating disc. The conveyor is rotated by means of endless chains or the like whereby the circulating route of the slats includes horizontally moving areas where capsules are horizontally maintained, and vertically moving areas where they take a vertical position. In the vertically moving areas a suitable means is required for preventing the capsules from falling off the slats. Such preventing means need direct contact with the capsules. If the sealer on the capsules is not dried, the sealing coat is likely to be broken. In addition, the prior art sealing apparatus uses a separate drying device. Thus, as a whole the sealing unit becomes large in size, occupying a large installation site, and the structure becomes complicated. Because of the limited space, the prior art sealing apparatus is not allowed to employ more than one coating stations. In fact, however, the single coating station is not sufficient to obtain a strong seal between the caps and the bodies of capsules.

The inventors have made another proposal which is disclosed in Japanese Laid-Open Patent Publication (Kokai) No. 61-68050. This prior art invention provides a capsule conveyor device on which capsules are at a slant in the direction in which they are conveyed, thereby ensuring that capsules of various sizes can be sealed. However, this prior invention has not solved how to coat a sealer adequately along the seams between the caps and bodies of capsules during travel.

The capsule sealing apparatus of this invention, which overcomes the above-discussed and numerous other disadvantages and deficiencies of the prior art, comprises a capsule conveyor device comprising horizontally maintained slats including capsule resting slits, each slit including an opening at its bottom, a tank for storing a sealer disposed below a circulating route of the capsule conveyor device, a rotary coating means for picking up the sealer from the tank and coating same along the seam between a cap and a body of each capsule, said rotary coating means being insertable through the openings of the capsules and coming into contact with the seams of the capsules so as to impart frictional rotating drive to the capsules.

In a preferred embodiment, the capsule resting slits slant to the extent that the capsules are accommodated therein at a slant of about 5° with respect to the horizontal plans in the direction in which the slats are circulated.

In another preferred embodiment, the capsule resting slits have side walls slanting so that the capsules accommodated therein slant in the direction in which the slats are circulated.

In a further preferred embodiment, the capsule resting slits have V-shaped side walls so that the capsules accommodated therein are kept in linear contact therewith.

In a still further preferred embodiment, the capsule resting slits slant so that the capsules accommodated therein slant with their one end downward.

In another preferred embodiment, the capsule conveyor device comprises means for shifting the capsules accommodated in the respective capsule resting slits in a desired direction by direct engagement therewith.

In a further preferred embodiment, the capsule conveyor device comprises means for positioning the capsules in place in the capsule resting slits by direct engagement therewith after they are shifted by the shifting means.

In a still further preferred embodiment, the sealing device is disposed downstream of the rotation of the slats, and comprises a second rotary coating means for coating the sealer picked up from the tank on the seams coated by the first coating means, the second coating means being adapted to be inserted through the openings of the capsule resting slits and come into contact with the seams of the capsules so as to cause same to rotate.

In a preferred embodiment, the coating means comprises a V-shaped peripheral edge along its entire circumference and the second coating means comprises a stepped peripheral edge along its entire circumference so that the peripheral

edges come into full contact with the seams between the caps and the bodies of capsules.

In another preferred embodiment, the capsule conveyor device is covered by a drying duct, except for a portion thereof at which the sealing means is located.

Thus, the invention described herein makes possible the objectives of (1) providing a capsule sealing apparatus having a simplified construction and capable of readily assembling, maintaining and repairing, (2) providing a capsule sealing apparatus capable of drying the sealer coated on the capsules during travel in a relatively short period of time, (3) providing a capsule sealing apparatus capable of sealing the capsules irrespective of variations in sizes, and (4) providing a capsule sealing apparatus capable of effecting double coats on the seams between the caps and the bodies of capsules so as to secure sufficient thickness of coat throughout the seams.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 is a plan view showing a capsule sealing apparatus according to the present invention;

Figure 2 is a side view showing the apparatus of Figure 1;

Figure 3 is a plan view showing the slats shown in Figure 1;

Figure 4 is a cross-sectional view taken along the line IV-IV in Figure 3;

Figure 5 is a cross-sectional view taken along the line V-V in Figure 3;

Figure 6 is a plan view showing a main portion of the capsule conveyor device shown in Figure 1;

Figure 7 is a schematic view exemplifying the operation of the capsule conveyor device;

Figure 8 is a cross-sectional view taken along the line VIII-VIII in Figure 7;

Figure 9 is a cross-sectional view showing the sealing device incorporated in the apparatus of Figure 1;

Figures 10 and 11 are cross-sectional views showing the relationships between a capsule and a sealer coating means;

Figure 12 is a perspective diagrammatic view showing a drying duct covering the capsule sealing apparatus;

Figure 13 is a schematic view showing the capsule aligning device;

Figure 14 is a cross-sectional view showing the capsule aligning device of Figure 13;

Figure 15 is a schematic fragmentary view showing a protective plate of the capsule regulating roller; and

Figure 16 is a schematic fragmentary view showing a guard plate of the contrarotating roller.

Referring to Figures 1 and 2, the capsule sealing apparatus includes a capsule conveyor unit 30 that is provided with a capsule aligning device 20 designed to align capsules in a desired direction, and a capsule sealing device 40 located adjacent to anywhere along the conveying route of the capsules.

The capsule conveyor unit 30 includes a pair of horizontal sprockets 37 and a chain 38 running on the sprockets 37. The chain 38 carries a plurality of flat slats 31, each of which is circulated in a horizontal posture. Each slat 31 is provided with capsule resting slits 31a whereby capsules are horizontally secured on the slat 31. Hereinafter, the capsule resting slits will be referred to as "slits". The slats 31 are moved sideways in straight movement areas 32 provided in opposite sides of the chain 38, and turned in semi-circular movement areas 33 provided around each sprocket 37, thereby changing their advancing direction. Unlike the prior art referred to above, the slats 31 are horizontally maintained throughout the travel.

The capsule aligning device 20 is disposed above the point from which the slats 31 start in the straight movement area 32, and horizontally aligns capsules having filled contents sealed by the caps. Then the capsule aligning device 20 transfers the aligned capsules onto each slat 31. The reference numeral 35 denotes a capsule shifter, which will be described below.

A sealing device 40 is disposed downstream in the direction in which the slats 31 are moved. The sealing device 40 coats each charged capsule with a sealer along the seam between the cap and the body so as to seal the capsule. There is provided a capsule positioning device 36 (Figure 2), which will be described below.

As shown in Figures 3 to 5, each slat 31 mounted on the capsule conveyor unit 30 has a plurality of slits 31a in which each capsule is secured. The slits 31a slant at about 5° in the direction in which the slats 31 as a whole are moved, thereby enabling each capsule to slant at the same angle in the same direction. One row can accommodate a desired number of capsules; in the illustrated embodiment, each row accommodates ten capsules. The number of rows are also optionally determined. The slit 31a has a slightly greater width than the maximum diameter of each capsule 90, and is longer than the axial length thereof. Each capsule is open at its top end. The capsule aligning device 20 aligns the capsules 90 such that the capsules are arranged with their caps 92 situated inside of the respective bodies 91.

As shown in Figure 5, each slit 31a has a V-shaped bottom, and when the slats 31 carrying the

capsules 90 are in the semi -circular movement area 33 the bottom is slanted inward at about 3° so that when the capsules 90 are placed in the slits 31a, the caps 92 are situated lower than the bodies 91.

The reference numeral 31b denotes guide grooves for facilitating the conveyance of capsules 90, the guide grooves being formed in the direction in which the slats 31 are moved in the semi-circular movement area 33. The slits 31a and the guide groove 31b connect with each other.

In Figure 4 the reference numeral 31c denotes grooves in which rollers fit, the grooves being in parallel with the guide grooves 31b, and connecting with the slits 31a through openings 31d. The capsules 90 are placed on the slits 31a such that the bodies 91 and the caps 92 meet in the openings 31d.

Referring to Figures 6 to 8, the capsule shifter 35 includes five capsule shifting plates 35a whose top ends are individually inserted in the grooves 31c of the slats 31. As shown in Figure 8, the capsule 90 placed in each slit 31a is raised by the capsule shifting plate 35a when the slats 31 pass the capsule shifter 35.

The capsule positioning device 36 includes five cap guide members 36a, each of which is situated alongside each cap raised by the capsule shifting plates 35a as shown in Figure 6. Each cap guide member 36a is vertically arranged above each guide groove 31b, in the direction in which the slats 31 are moved, and its lower end is fitted in the guide groove 31b. Each cap 92 of the capsules 90 comes into engagement with the cap guide member 36a, and forces the capsule into the slit 31a. In order to locate the capsules exactly in the slits 31a, the side of each cap guide member 36a is slanted toward the slit 31a above the capsule sealing device 40. In this way the capsules 90 are placed in the slits 31a such that the seams between the caps 92 and the bodies 91 are situated in the openings 31d.

Referring to figure 9, the sealing device 40 includes a heater built-in tank 41 for storing a sealer, a first coating unit 42 having five coating discs 42a and a second coating unit 43 having five finish discs 43a arranged in the direction of feed of the slats 31, respectively. The second coating unit 43 is designed to add a coat to the one effected by the first coating unit 42. The first coating unit 42 is positioned in place so that the peripheral edge of each coating disc 42a fits in the slits 31a of the slats 31 through the opening 31d as shown in figure 10. The first coating unit 42 is rotated in the opposite direction to that of feed of the slats 31. The peripheral edges of the coating discs 42a have a V-shaped groove as shown in Figure 10, and the lower portion of the first coating unit 42 is submerged in the sealer in the tank 41. The upper portion of the peripheral edge fitted in the slit 31a pushes the capsules 90 upward. The coating discs 42a pick up the sealer from the tank 41 and coat it along the seams between the caps and bodies of the capsules 90 through the respective coating discs 42a. The capsules 90 in the slits 31a are rotated by the coating discs 42a under the guidance of the cap guide members 36a in the slits 31a, and during rotation the sealer is coated along the seams between the caps 92 and the bodies 91 of the capsules 90. In this way the seams are sealed.

Each finish disc 43a of the second coating unit 43 has a stepped peripheral edge as shown in Figure 11. Likewise, the lower portion of the peripheral edges of each finish disc 43a is submerged in the sealer in the tank 41, and the upper portion thereof is fitted into the slits 31a through the opening 31d. The stepped peripheral edges of the finish discs 43a fitted into the slits 31a push the capsules 90 upward. The capsules 90 are rotated by the finish discs 43a under the guidance of the guide members 36a, and coated with the sealer along the seams between the caps 92 and the bodies 91 of the capsules 90.

The tank 41 is provided with scrapers 42b and 43b designed to remove excess sealer from the coating discs 42a and the finish discs 43a so as to hold an adequate amount of sealer thereon.

Referring to Figure 12, the capsule conveyor unit 30 is covered with a drying duct 39, except for the portion at which the capsule aligning device 20 and the sealing device 40 are joined. The drying duct 39 receives a supply of air, and the slats 31 travel through the drying duct 39 during which travel the sealer coated on the capsules are dried. In this way the seal between the caps 92 and the bodies 91 of the capsules 90 is effected.

There is provided a capsule collecting device 50 (Figures 1 and 2). The collecting device 50 is provided with a sucking pipe or vacuum pipe 51 in which the pressure is reduced so as to suck the capsules 90 into the sucking pipe 51. In this way the capsules 90 are transported to a container (not shown).

The capsule aligning device 20 has a known structure that is disclosed in Japanese Laid-Open Patent Publication (Kokai) No. 60-190964. As shown in Figure 2, the aligning device 20 comprises a contrarotating drum or roller 24, a regulating roller 23, and a supplying drum 22. The reference numeral 21 denotes a hopper.

The hopper 21 is supplied with capsules 90 that contain a content in the bodies 91 closed with the caps 92.

The supplying drum 22 is rotated in the direction of arrow B, and is provided with pockets 22a

extending radially of the supplying drum 22 and spaced at intervals on the entire peripheral surface thereof. Each pocket 22a has a larger diameter than the outside diameter of the caps 92 so as to accommodate the capsules 90 therein. The hopper 21 supplies the capsules 90 into the pockets 22a at a point upstream of the rotation of the drum 22 rather than immediately above the hopper 21.

Each pocket 22a has an opening diverging in the direction in which the supplying drum 22 is rotated so as to enable each capsule 90 to enter each pocket 22a.

The reference numeral 25 denotes a brush roller having an axis in parallel with that o£ the supplying drum 22. The brush roller 25 rotates in the direction of arrow C, that is, in the same directionas that of the supplying drum 22. The brush roller 25 returns the capsules 90 left from the pockets 22a to the hopper 21.

Each pocket 22a has a larger inside diameter than the outside diameter of the cap 92 of each capsule 90, thereby enabling the capsules 90 to enter the pockets 22a from either the caps 92 or the bodies 91.

Each pocket 22a is connected to an air passage 22b at its bottom that extends axially with the supplying drum 22. The air passages 22b are connected to a suction port 22c. The suction port 22c is connected to the air passages 22b of the pockets 22a that rise up to the uppermost part of the supplying drum 22 so as to reduce the internal pressure in the pockets 22a. The suction port 22c is connected to a suction means (not shown) to effect reduction in pressure in the air passages 22b, and then the pockets 22a. In this way each capsule 90 is secured in each pocket 22a.

Referring to Figures 13 and 14, the air passage 22b connected to the lowermost part of the supplying drum 22 is connected to an air supply passage 22d disposed at the end face of the supplying drum 22. Compressed air or the like is supplied to the air supply passage 22d through which the compressed air is supplied to the pockets 22a located at the lowermost part of the supplying drum 22 so that the capsules 90 contained therein are discharged downward.

The reference numeral 22f denotes a plate for preventing the capsules 90 from falling from the pockets 22a opposite the plate 22f. The plate 22f is located adjacent to the lowermost part of the supplying drum 22 and at a point upstream of the rotation thereof.

The regulating roller 23 is positioned below the supplying drum 22, and is rotated in an opposite direction (the direction of arrow D) to that thereof. The regulating roller 23 is provided with pockets 23a extending axially therewith and spaced at intervals on the entire peripheral surface of the roller 23.

Each pocket 23a has a body supporting portion 23b radially extending for supporting the bodies of capsules, and a capsule bed portion 23c for accommodating lying capsules 90. The inside diameter of the body supporting portion 23b is larger than the outside diameter of the bodies 91 of capsules 90 but smaller than the diameter of the caps 92. The regulating roller 23 is designed to select capsules 90 by allowing capsules 90 to enter the body supporting portion 23b if they are inserted from their bodies 91 through the capsule bed portion 23c but by not allowing the capsules 90 to enter the body supporting portion 23b if they are inserted from their caps 92. The caps 92 of capsules 90 are accommodated in their capsule bed portion 23c when their bodies 91 are accommodated in the body supporting portions 23b. In this way the capsules 90 as a whole are accommodated in the pockets 23a. As a result, the top portions of the capsules 90 are prevented from projecting their caps 92 out of the regulating roller 23. In contrast, if the caps 92 of capsules are accommodated in the pockets 230 and the caps 92 are opposed to the body supporting portions 23b, the bodies 91 of these capsules 90 are projected outside the regulating roller 23.

The capsule bed portion 23c extends axially with the regulating roller 23 so that the capsules 90 are completely accommodated. The body supporting portion 23b of each pocket 23a is connected at its bottom to an air passage 23d extending axially of the regulating roller 23. The air passages 23d are connected to a suction port 23e. The suction port 23e is connected to a sucking means (not shown) that reduces the internal pressure in the pockets 23a through the air passage 23d.

The regulating roller 23 is provided with an air supply port 23f that is connected to the air passages 23d. Compressed air is supplied to the pockets 23a through the air passages 23d from the air supply port 23f. The capsules 90 contained in the pockets 23a are discharged downward under the pressure of the compressed air.

The reference numeral 23g denotes a guard plate disposed along a lower part of the regulating roller 23. As shown in Figure 15, the guard plate 23g is provided with notches 23h that are open toward the upstream direction, the notches 23h being open in the upstream direction. The notches 23h are located opposite to the pockets 23a, and one side wall is slanted so that the bodies 91 of the capsules 90 that project out of the regulating roller 23 are caused to lie down and accommodated in the capsule bed portion 23c in accordance with the rotation of the regulating roller 23. In this case, the capsules 90 are accommodated in the capsule bed portions 23c with their caps 92 in opposition to the

body supporting portions 23b.

The top end portion of the guard plate 23g faces the suction port 23e, and the falling capsules 90 are sucked under reduced pressure provided through the suction port 23e. In this way they are safely accommodated.

The contrarotating roller 24 disposed below the regulating roller 23 has the same configuration as that of the regulating roller 23, and as shown in

Figure 13, rotates opposite to the direction E of the regulating roller 23 but at the same velocity. The contrarotating roller 24 is provided with capsule accommodating pockets 24a on the entire peripheral surface thereof. Each capsule accommodating pocket 24a has a size sufficient to accommodate the capsules 90, and has openings open toward the pockets 23a so as to enable the openings of both pockets 23a and 24a to meet.

The bottom portion of the capsule accommodating pockets 24a are slanted so as to increase the depth thereof toward the body supporting portions 23b. The bottoms of the capsule accommodating pockets 24a are connected to an air passage 24b extending axially with the contrarotating roller 24. The air passage 24b is connected to the deepened portion of the capsule accommodating pockets 24a. The reference numeral 24c denotes a suction port that is connected to those air passages 24b that are situated in an area from the uppermost portion of the contrarotating roller 24 to the downstream portion thereof.

At the uppermost portion of the contrarotating roller 24 where the suction port 24c is connected to the air passages 24b of the pockets 24a, the pockets 24a face those pockets 23a of the regulating roller 23 that are situated at the lowermost portion thereof. In this way the internal pressure in the pockets 24a is reduced, and air is supplied into the pockets 23a of the regulating roller 23 so that the capsules 90 in the pockets 23a are conveyed into the pockets 24a of the contrarotating roller 24. At this stage, while the bodies of the capsules 90 are accommodated in the body supporting portions 23b of the pockets 23a, the capsules 90 are inserted into the pockets 24a with their caps 92 foremost, wherein the caps 92 are accommodated in the deep portions of£ the pockets 24a with parts of their bodies 91 projecting out of the contrarotating roller 24. Other capsules 90 accommodated in the capsule bed portions 23c of the regulating roller 23 in their lying posture are inserted into the pockets 23a with their caps 92 foremost by the flow of air blown from the body supporting portions 23b. In this way the caps 92 of the capsules go are accommodated in the deep portions of the pockets 23a, wherein the capsules 90 are placed in the pockets 24a in their slanting postures.

The reference numeral 24e. denotes a guide plate disposed so as to protect the pockets 24a passing the lowermost part of the contrarotating roller 24. The guide plate 24e is provided with notches 24f as shown in Figure 16, which have a slanting side wall designed to cause the capsule 90 to fall down and accommodate them in the pockets 24a when parts of the capsules 90 project out of the contrarotating roller 24. In this way the guide plate 24e ensures that once the pockets 24a have passed it the capsules 90 are aligned, and accommodated in the deep portions of the pockets 24a.

The contrarotating roller 24 is provided with an air supply port 24d at its lower part, which supplies air to the pockets 24a through the air passages 24b situated in the lowermost part of the contrarotating roller 24. Compressed air is supplied to the air supply port 24d, and is supplied into the pockets 24a so that the capsules 90 contained in the pockets 24a are discharged downwards.

The capsules 90 discharged from the pockets 24a are transferred into the slits 31a of the slats 31 of the capsule conveyor unit 30.

In operation, the capsules 90 are aligned in the slits 31a of the slats 31. Then the slats 31 are conveyed to the sealing device 40, in the course of which the capsules 90 are raised by the capsule shifting plates 35a so as to shift them toward their caps 92. The caps 92 of the capsules 90 are brought into contact with the cap guide members 36a, thereby locating each capsule 90 in place in the slits 31a so that the seam between the cap 91 and the body 91 of each capsule is located at the sealing position, that is, in the opening 31d in the slit 31a.

At this stage, the slats 31 are conveyed above the sealing device 40. The coating discs 41a are forced into the openings 31d and come into abutment with the seams between the caps 92 and the bodies 91 of the capsules 90 so that sealer is coated along the seams while the capsules 90 are in rotation. Then, the finish discs 43a are equally forced into the openings 31d and applied to the same seams of each capsule 90. In this way the sealer is coated on the seams of the capsules 90 to a desired thickness.

The capsules 90 whose seams are sealed with the sealer are conveyed to the drying duct 39 and travel within it. In this way the sealer becomes dry. Finally, the capsules 90 are sucked into a container (not shown) by means of the vacuum pipe 51 of the capsule collecting device 50.

Claims

1. A capsule sealing apparatus comprising a capsule conveyor device comprising horizontally maintained slats including capsule resting slits,

each slit including an opening at its bottom, a tank for storing a sealer disposed below a circulating route of the capsule conveyor device, a rotary coating means for picking up the sealer from the tank and coating same along the seam between a cap and a body of each capsule, said rotary coating means being insertable through the openings of the capsules and coming into contact with the seams of the capsules So as to impart frictional rotating drive to the capsules.

2. A capsule sealing apparatus according to claim 1, wherein the capsule resting slits slant to the extent that the capsules are accommodated therein at a slant of about 5° with respect to the horizontal plane in the direction in which the slats are circulated.

3. A capsule sealing apparatus according to claim 1, wherein the capsule resting slits have side walls slanting so that the capsules accommodated therein are at a slant in the direction in which the slats are circulated.

4. A capsule sealing apparatus according to claim 1, wherein the capsule resting slits have v-shaped side walls so that the capsules accommodated therein are kept in linear contact therewith.

5. A capsule sealing apparatus according to claim 1, wherein the capsule resting slits slant so that the capsules accommodated therein slant with their one end downward.

6. A capsule sealing apparatus according to claim 1, wherein the capsule conveyor device comprises means for shifting the capsules accommodated in the respective capsule resting slits in a desired direction by direct engagement therewith.

7. A capsule sealing apparatus according to claim 1, wherein the capsule conveyor device comprises means for positioning the capsules in place in the capsule resting slits by direct engagement therewith after they are shifted by the shifting means.

8. A capsule sealing apparatus according to claim 1, wherein the sealing device is disposed downstream of the rotation of the slats, and comprises a second coating means for coating the sealer picked up from the tank on the seams coated by the first coating means, the second coating means being adapted to be inserted through the openings of the capsule resting slits and come into contact with the seams of the capsules so as to cause same to rotate.

9. A capsule sealing apparatus according to claim 1, wherein the rotary coating means comprises a V-shaped peripheral edge along its entire circumference and the second coating means comprises a stepped peripheral edge along its entire circumference so that the peripheral edges come into full contact with the seams between the caps and the bodies of capsules.

10. A capsule sealing apparatus according to claim 1, wherein the capsule conveyor device is covered by a drying duct, except for a portion thereof at which the sealing means is located.

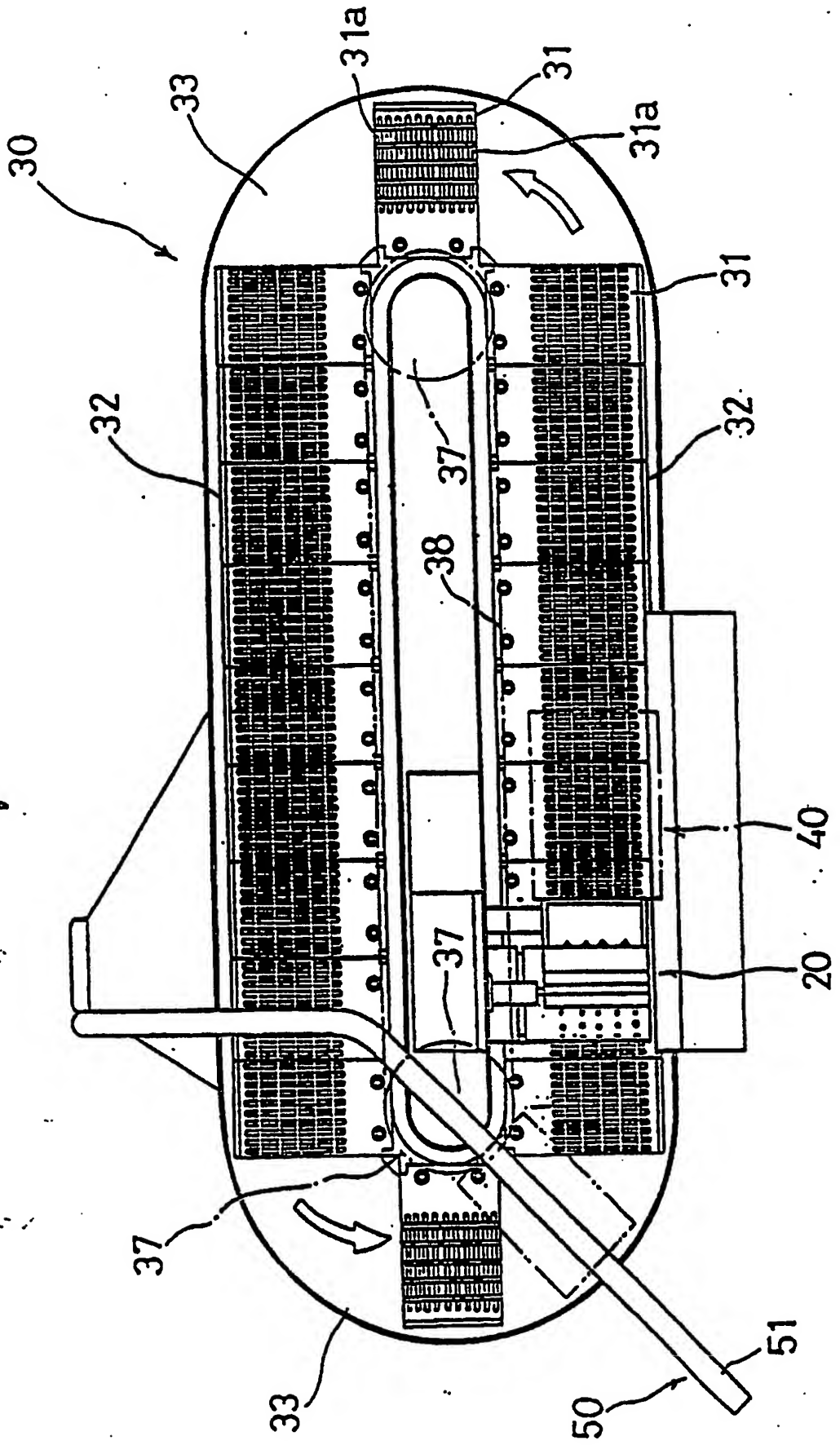

Fig. 1

Fig. 2

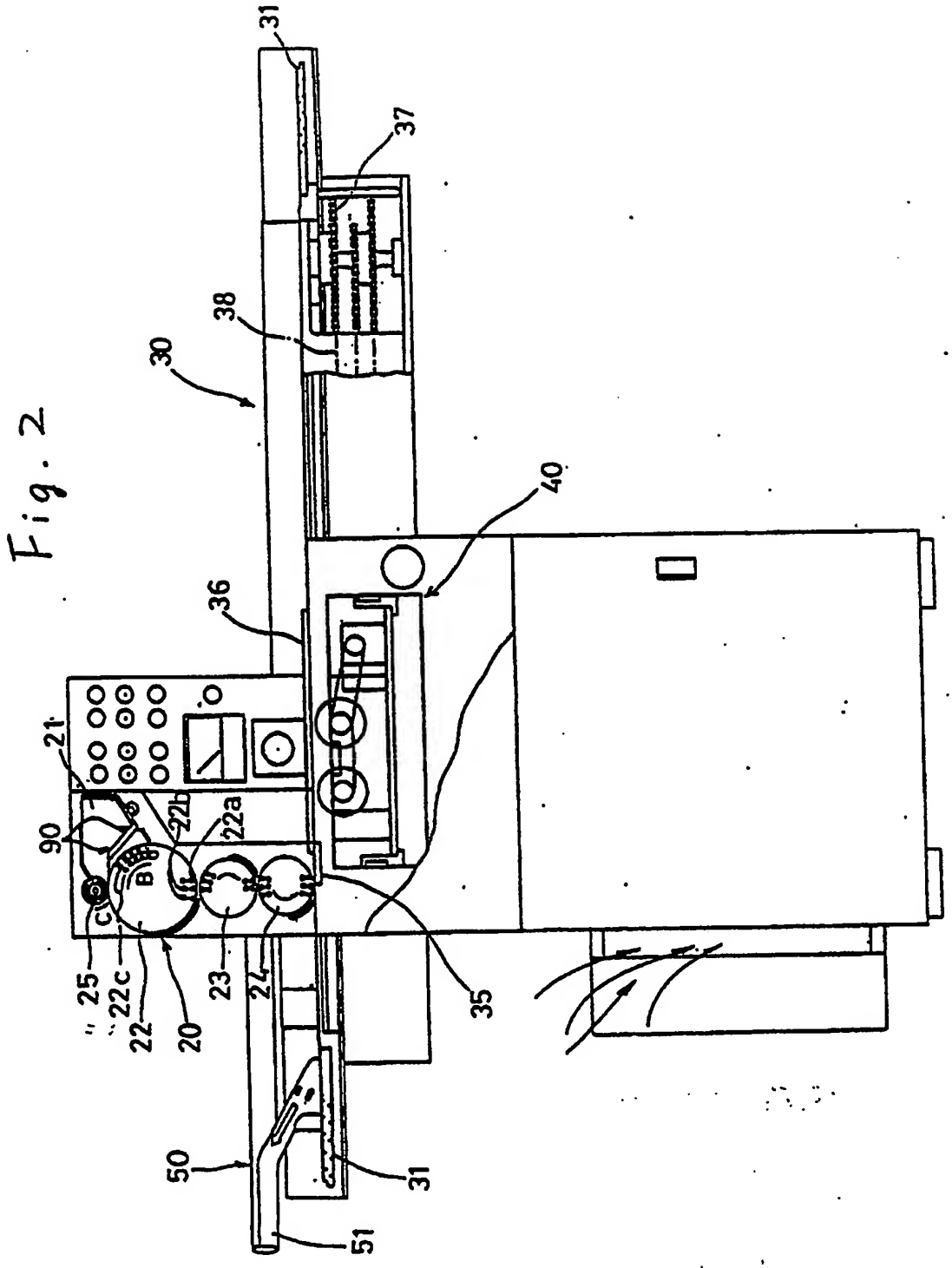

Fig. 3

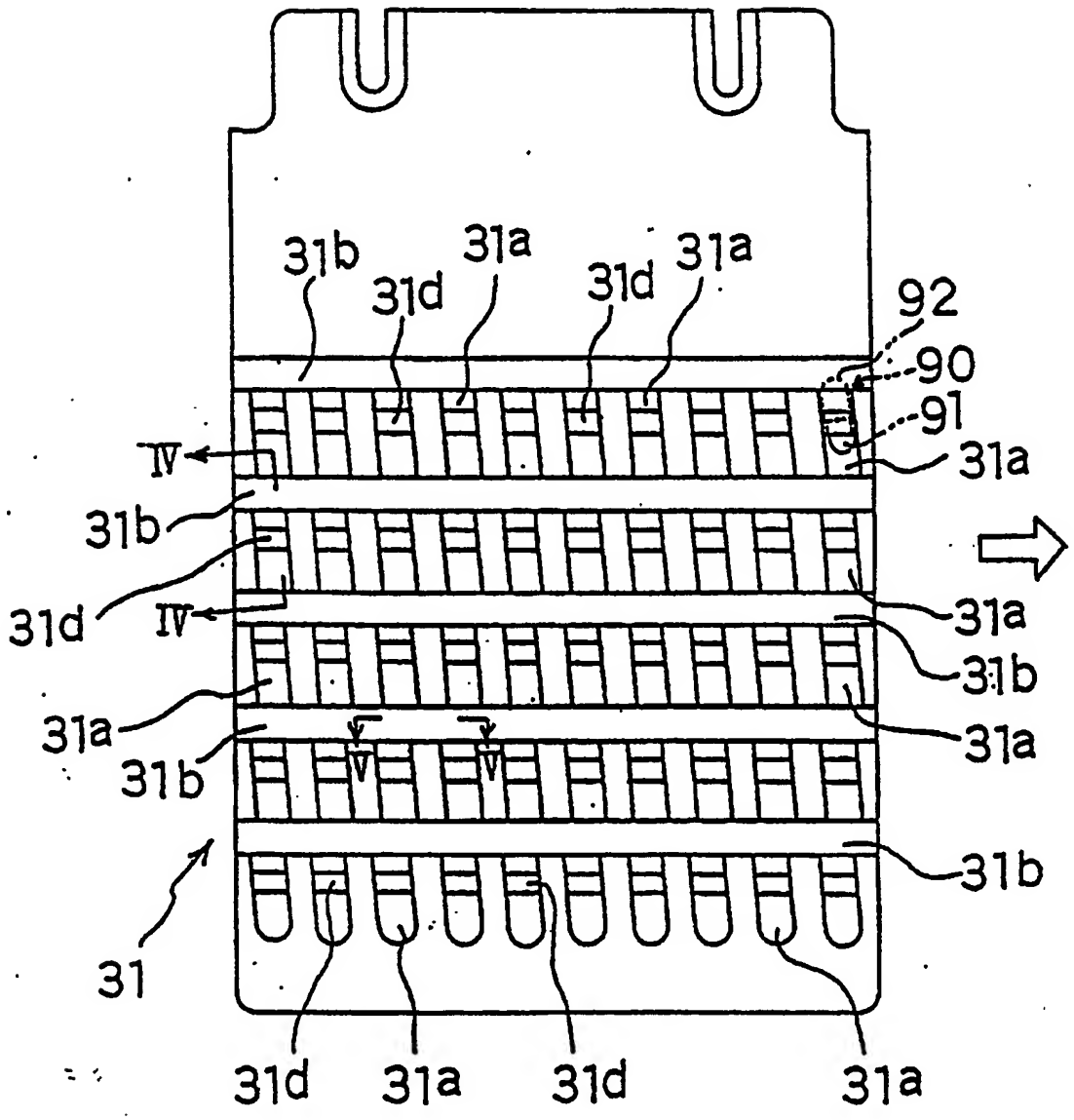
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Fig. 4

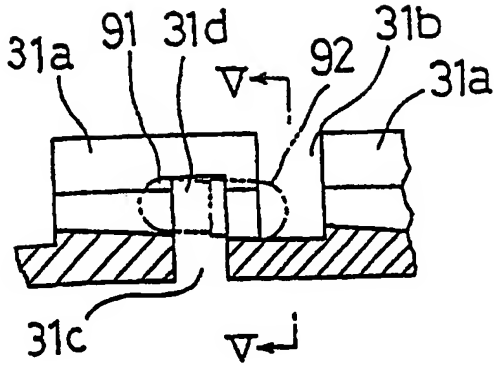


Fig. 5

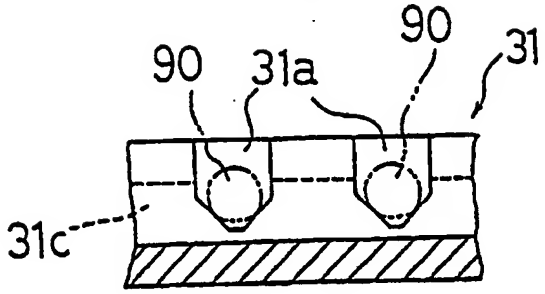


Fig. 6

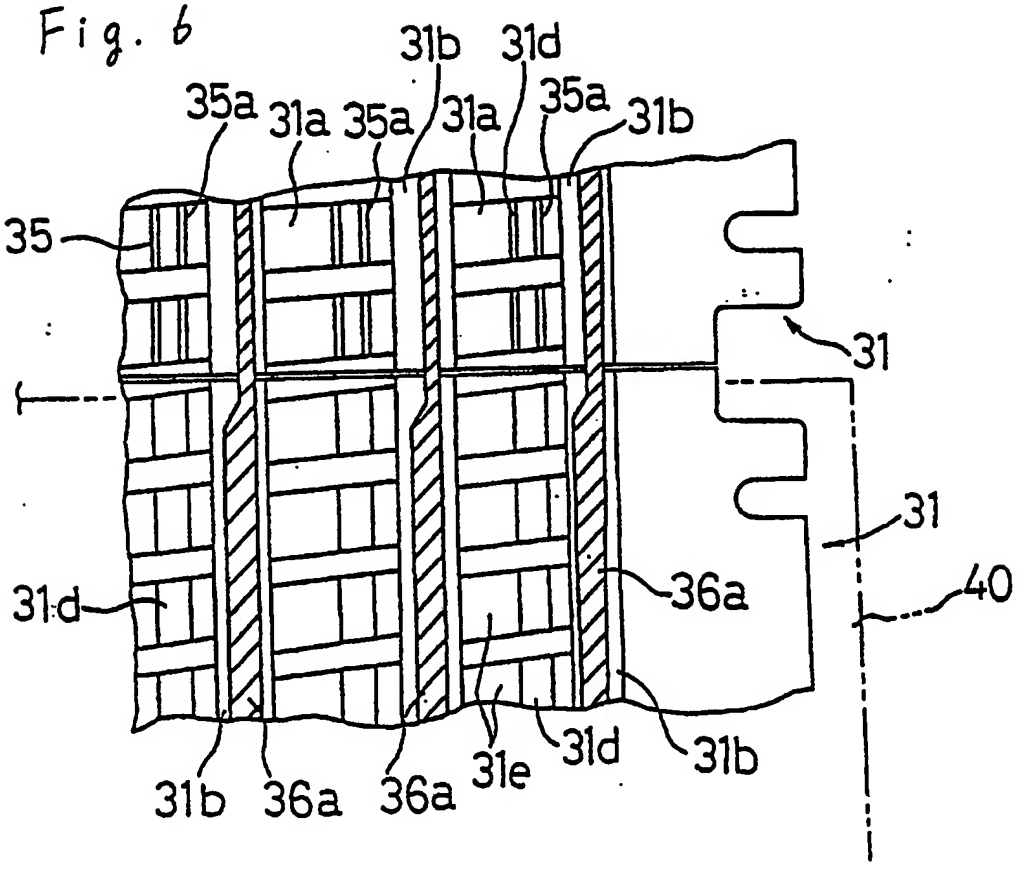
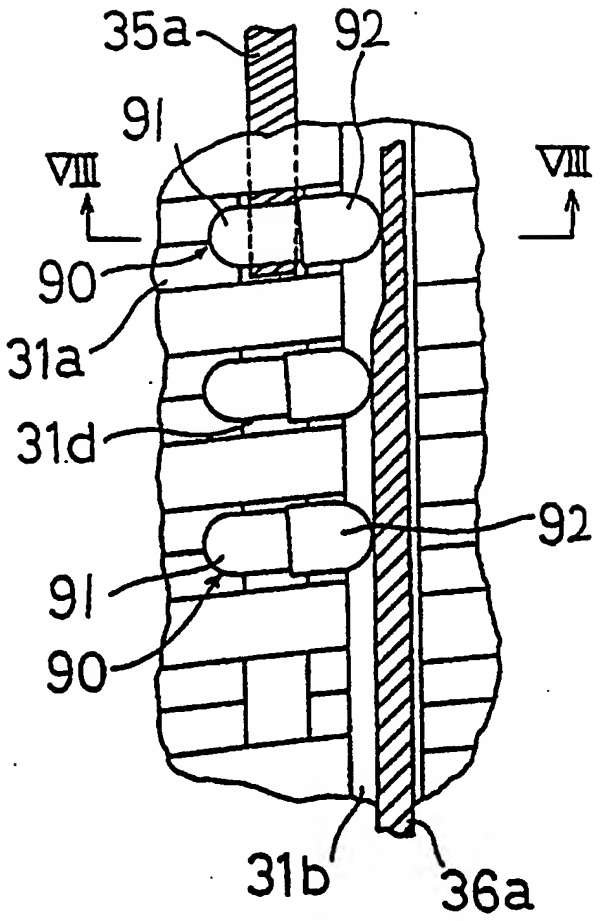


Fig. 7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VIII
VIII
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31a
31d
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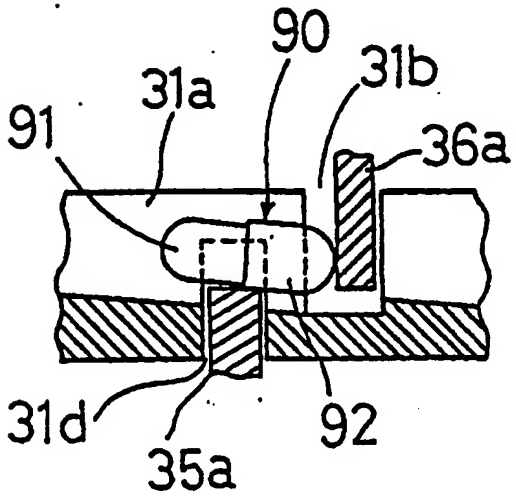
31b
36a

Fig. 8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35a

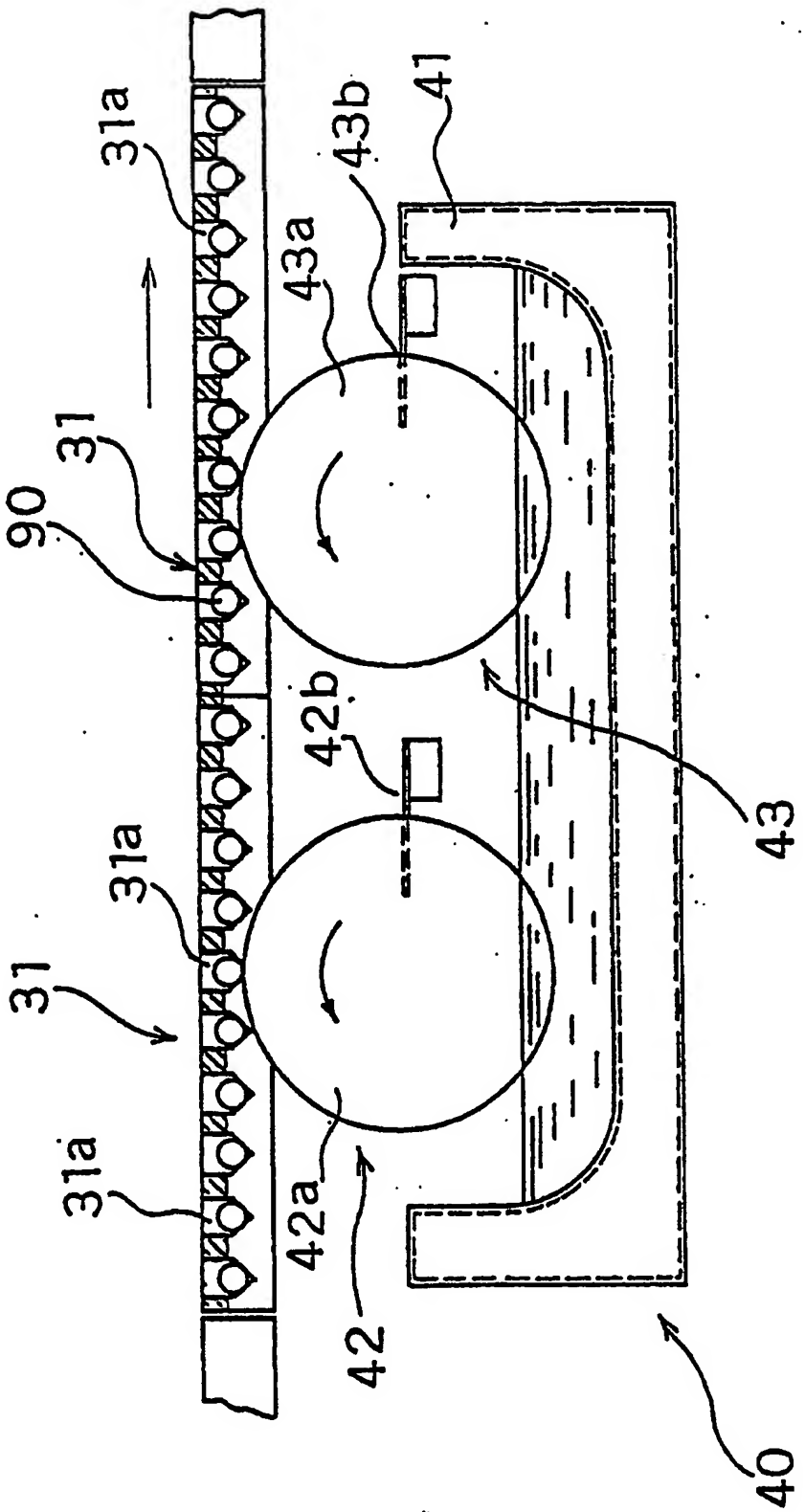


Fig. 9

Fig. 10

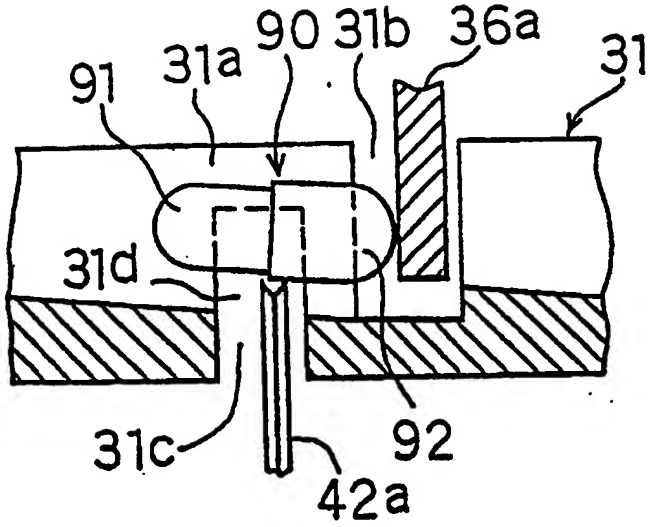
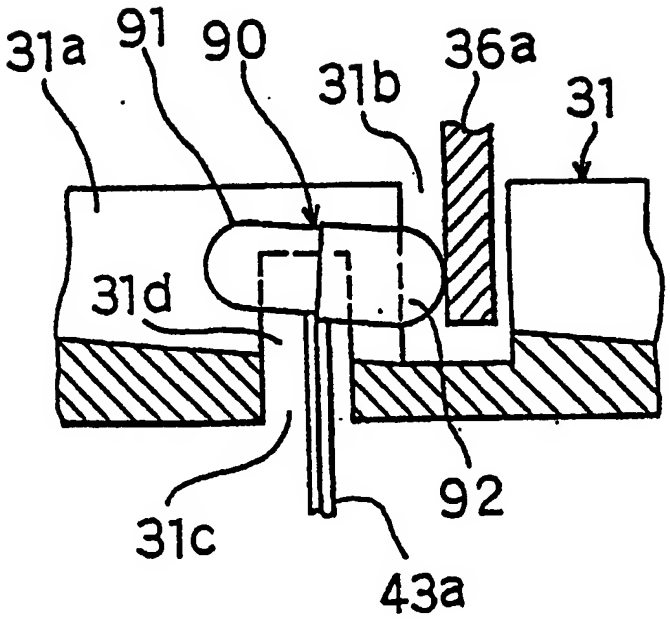

90
31b
36a
31
91
31a
31d
31c
92
42a

Fig. 11


31a
91
90
31b
36a
31
31d
92
31c
43a

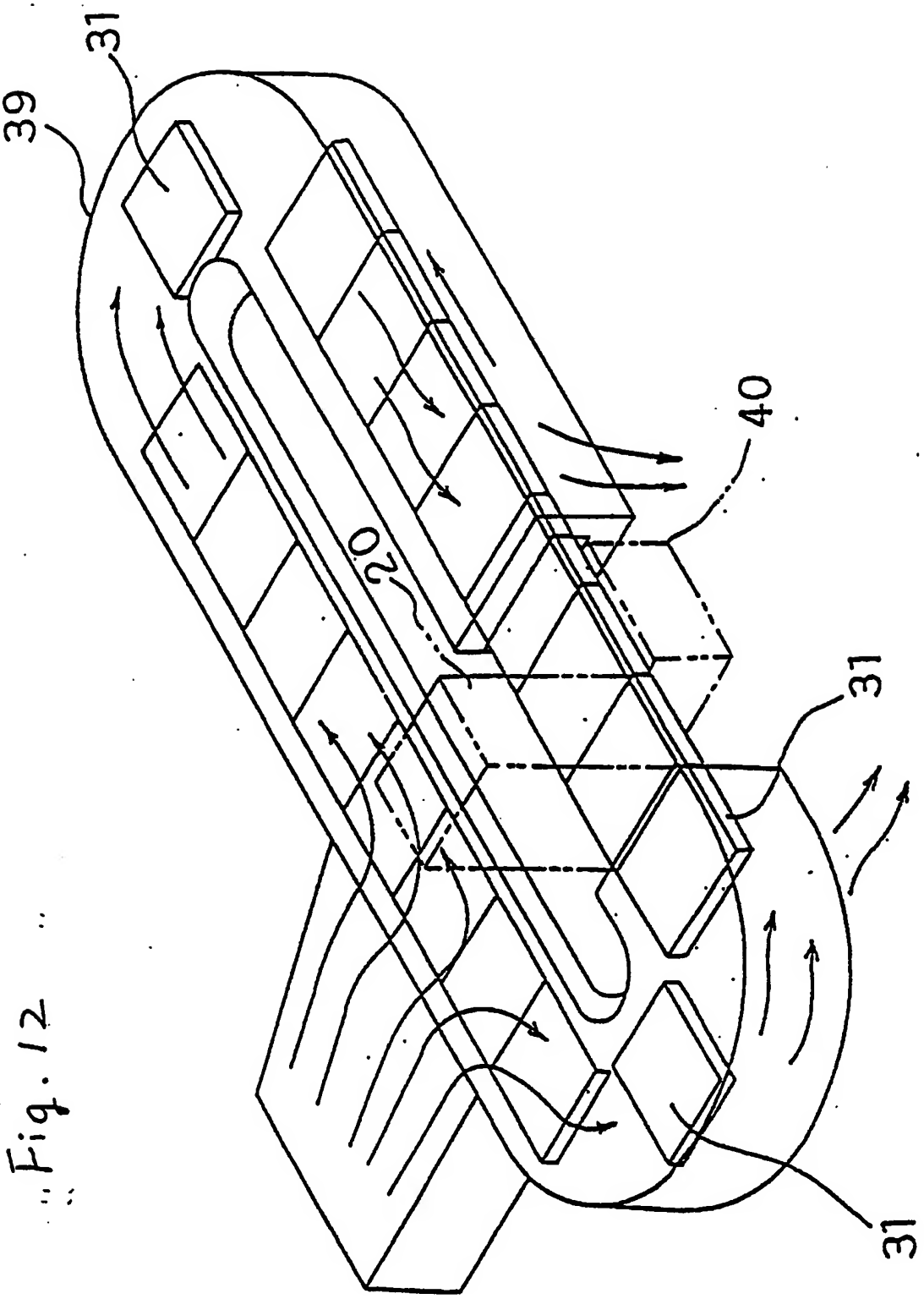


Fig. 12

Fig. 14

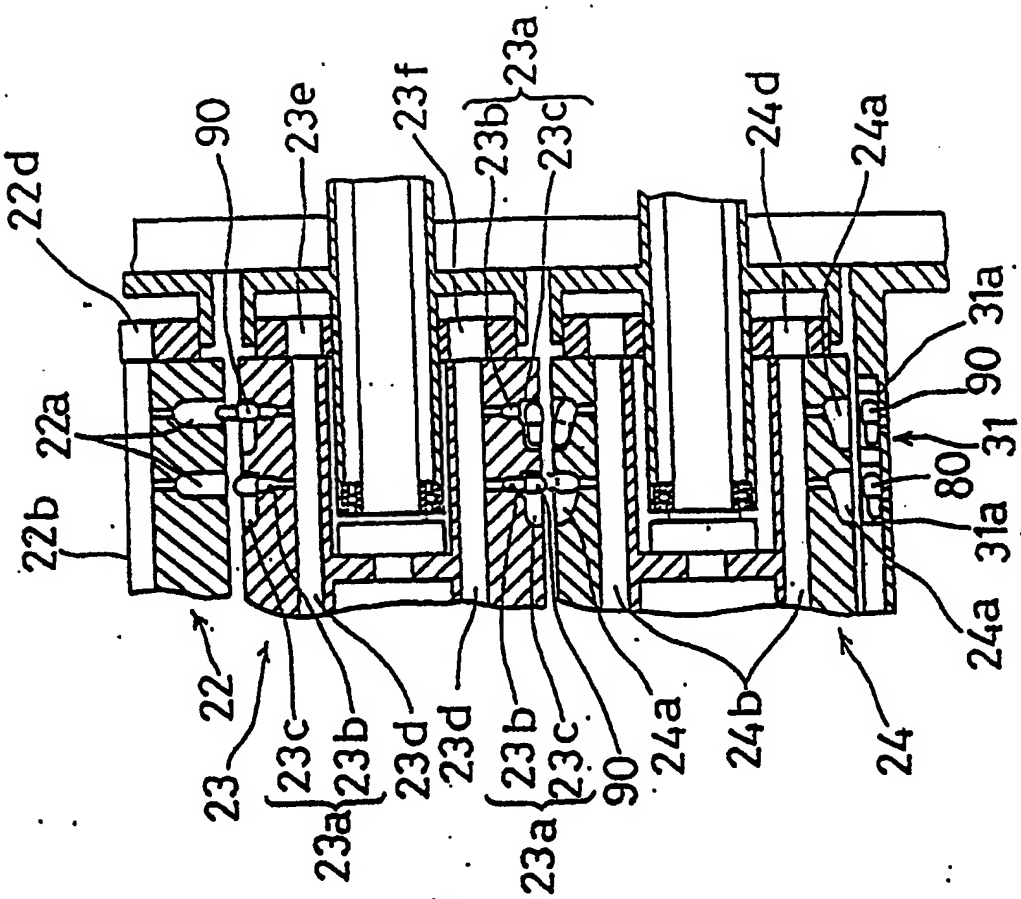

22d
90
23e
23f
23b
23c
23a
24d
24a
22a
22b
31a
90
31
80
22
23
23c
23b
23a
23d
24a
24b
24

Fig. 13

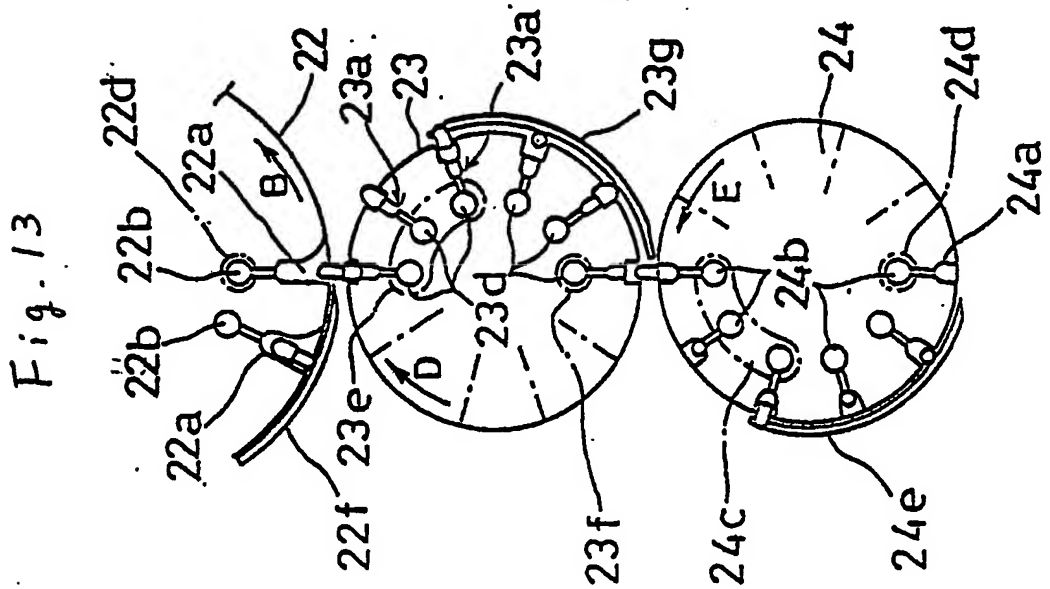

22d
22
23a
23
23g
24
24d
22a
22b
B
E
D
23e
23d
24b
24a
22f
23f
24c
24e

Fig. 15

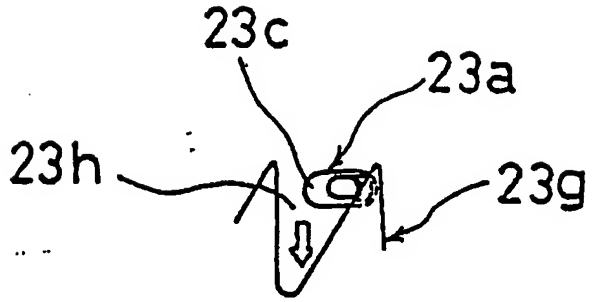
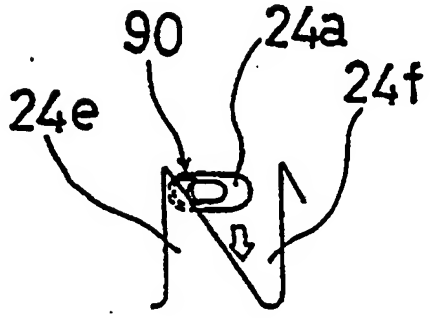


Fig. 16



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 30 6370

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A,D	EP-A-0 154 966 (NIPPON ELANCO K.K.) * The whole document *	1	A 61 J 3/07
A	EP-A-0 271 627 (MASO) * Column 4, lines 39-49; column 7, line 31 - column 8, line 3; figures 5,8 *	1	
A	US-A-2 962 851 (HALL) * Claims; figures *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 61 J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13-09-1990	BAERT F.G.

CATEGORY OF CITED DOCUMENTS

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